Non-Vaccine Acute Respiratory Disease Interventions (NOVARDIs) It's Deja Vu All Over Again!: History of NOVARDI Research in the Military and Review of Current Knowledge

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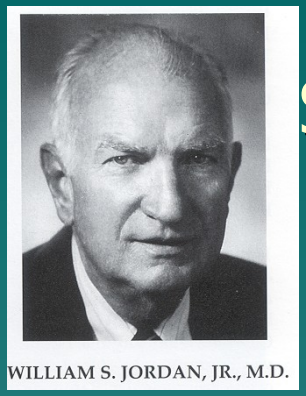
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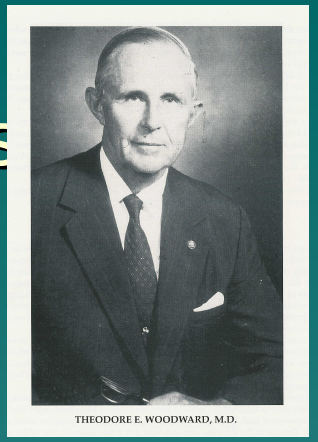
Special Acknowledgements


THEODORE E. WOODWARD, M.D.

- William Jordan, Author of Chapter: “History of the Commission on Acute Respiratory Diseases, Commission on Air-Borne Infections, Commission on Meningococcal Meningitis and Commission on Pneumonia”
  - Theodore Woodward, Editor of “The Armed Forces Epidemiological Board; The History of the Commissions” 1994
- Philip Sartwell, Author of Chapter: “Common Respiratory Diseases”
  - John Coats, Editor of “Preventive Medicine in World War II, Volume IV: Communicable Diseases Transmitted Chiefly Through Respiratory and Alimentary Tracts” 1958

Outline

- Introduction
- History: Pandemic to Adenovirus Vaccine Loss
- Non-Vaccine Interventions
- Recommendations

Introduction: Respiratory Diseases

- Respiratory diseases are among the most prevalent of diseases and are highly communicable. The problem has always existed in the military
- The Influenza pandemic of 1918-1919 quickly spread from Camp Funston, KS, to the rest of the US, Europe and then throughout the world.
  - Estimates of deaths are in excess of 20 million worldwide

Camp Funston, KS, Spring 1918 – First Wave of 1918-1919 Influenza Pandemic

My Great Grandfather: Died in the Flu Epidemic while visiting his brother in

Guan Jing Xian □□□ 1867–1919 – Physician in Empress Dowager Royal Court in China

Early ARD Research by U.S. Army

- Dec 1940 – Recommendations to establish and Army board to investigate epidemic diseases
- Feb 1941: First Meeting Board for Investigation and Control of Influenza and Other Epidemic Diseases
- Respiratory Pathogens
  - Influenza
  - Measles
  - Meningitis
  - Pneumonia
  - Streptococcal Infections

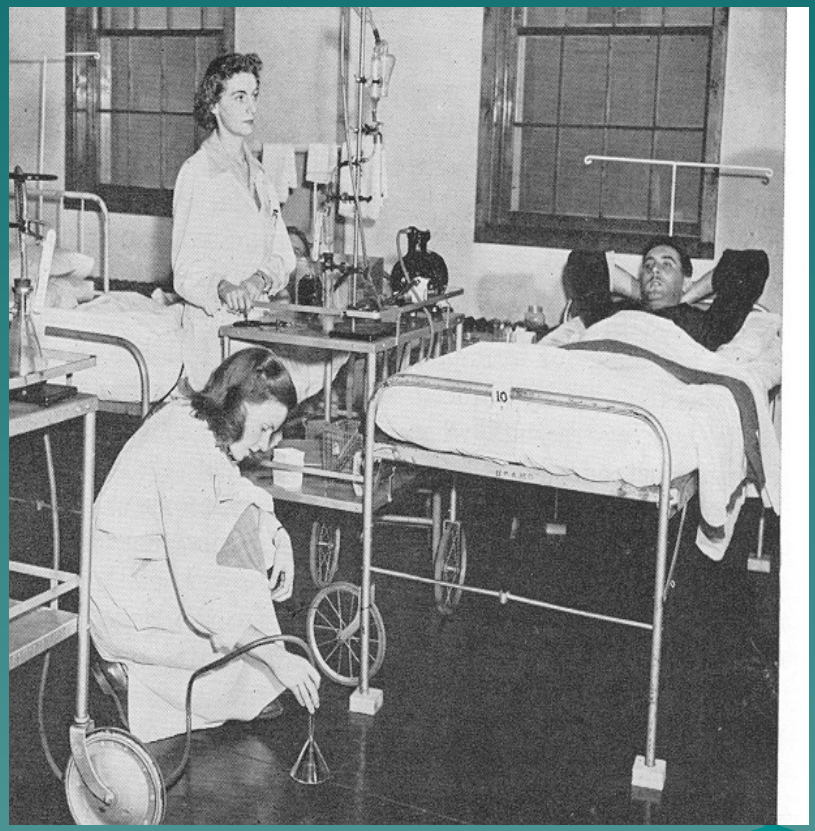
ORIGINAL AFEB, 1942

The original members of the Board for the Investigation and Control of Influenza and Other Epidemic Diseases
12–13 May 1942

Commission on Acute Respiratory Disease (CARD), Fort Bragg 1943

CARD Research Efforts

- Etiology
- Clinical Classification
- Epidemiology
- Outbreak Investigation
- Prevention and Control Methods
  - e.g. Adenovirus vaccine development & deployment



Adenovirus Efforts

- Epidemiology
- Development and Deployment of the Vaccine
- Very effective in decreasing ARDS

Typical Infection Rates in U.S. Army Recruits pre-Adenovirus Vaccine (50's-60's)

Respiratory Illness among U.S. Army Recruits during winter training: 1954 Ft. Dix, NY

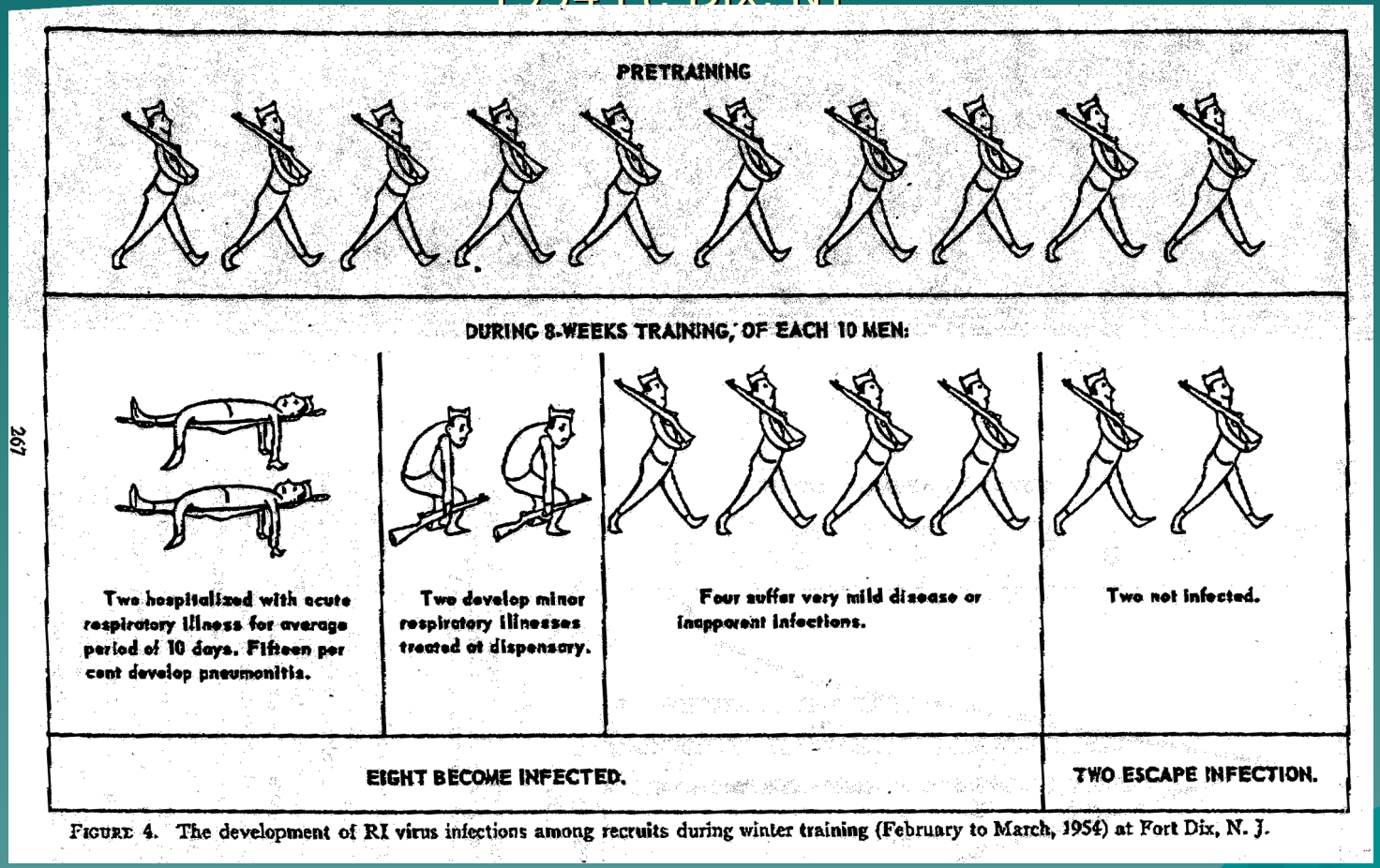
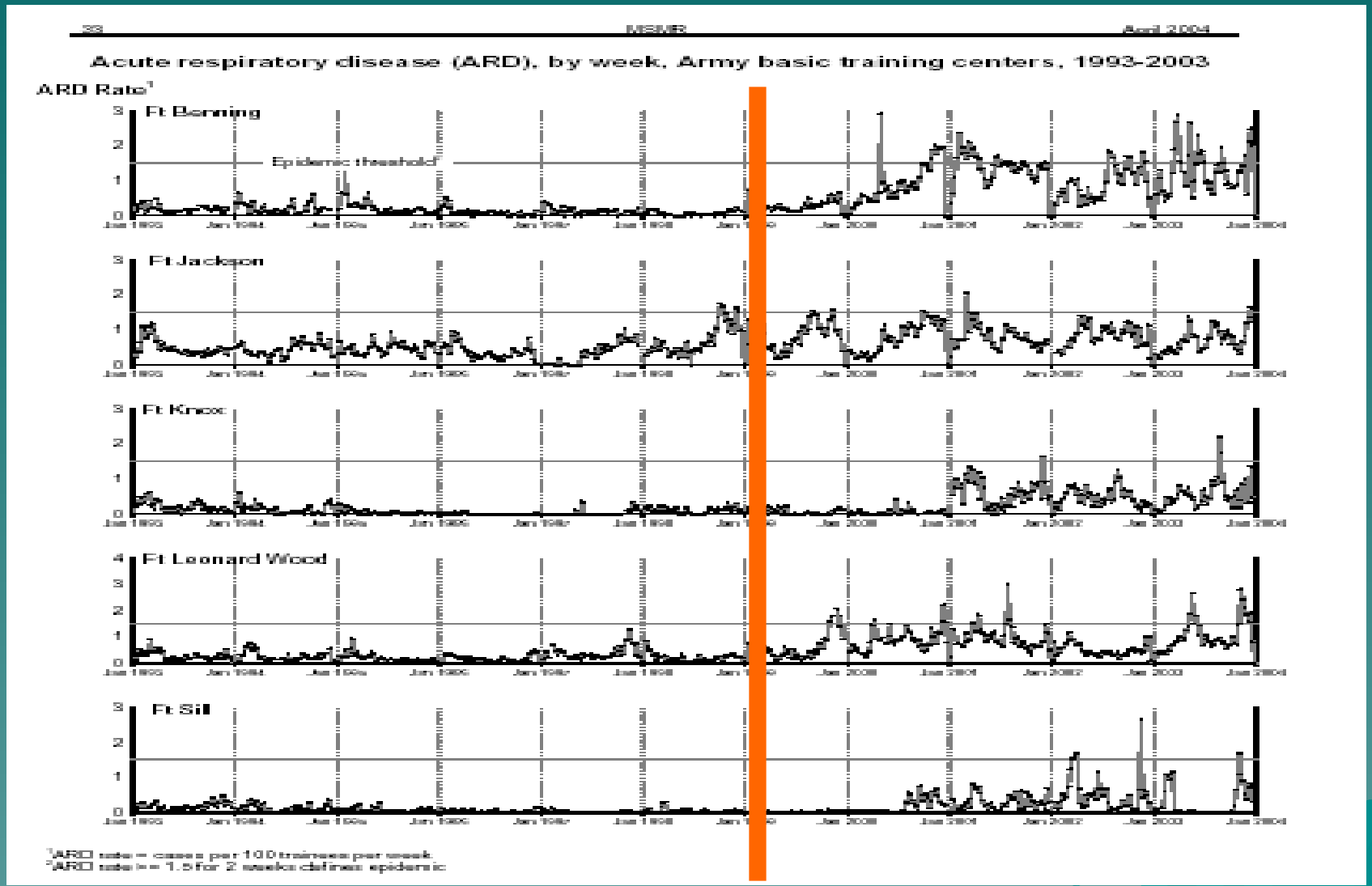
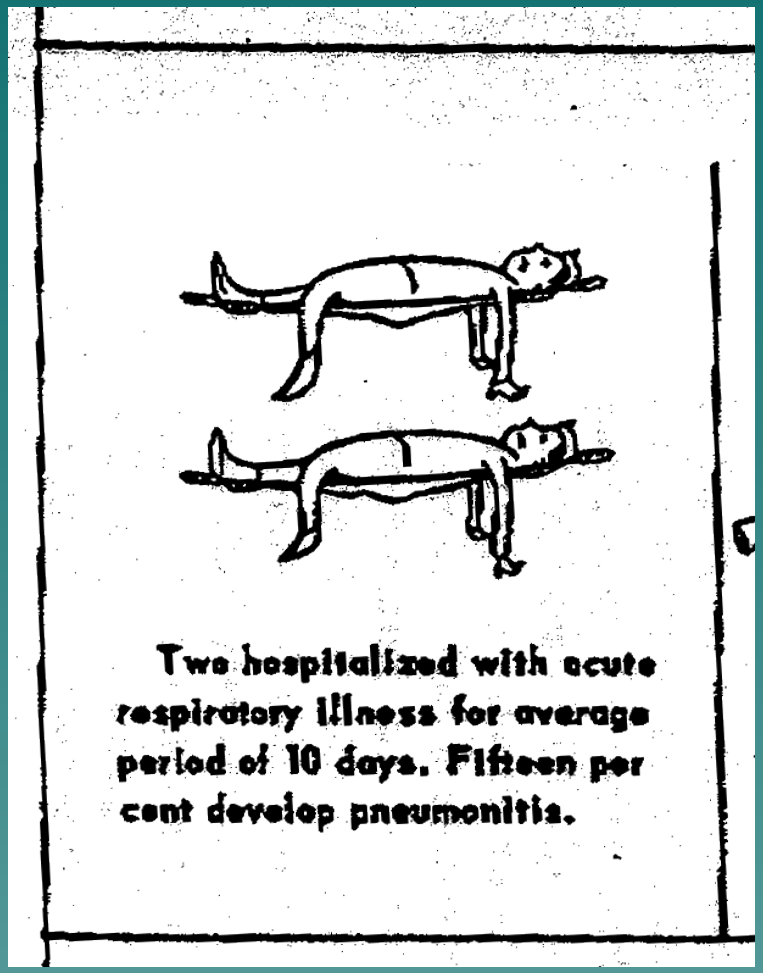


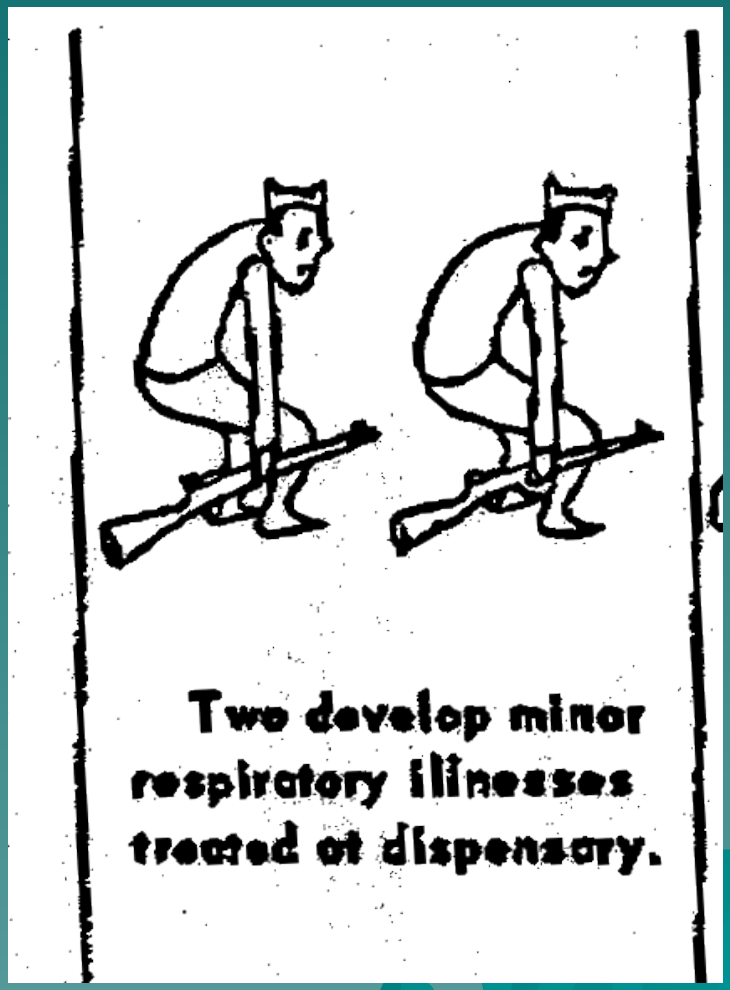
FIGURE 4. The development of RI virus infections among recruits during winter training (February to March, 1954) at Fort Dix, N. J.

ARD rate by week US Army BCT Posts 93’-03’



Without the vaccine, we are “back in the 50’s”!





Other CARD Research

- Besides the adenovirus vaccine, what other preventive measures did CARD research?
- Did any of these measures work?
- What can we use now?

Stop what you're doing! Adenovirus Vaccine is the answer !

ARD Concerns

- Adenovirus
- Influenza
- SARS
- Others

Control Methods

Control Measures

- Personal Measures
  - Air or Hand
- Administrative Controls
  - Keeping People Separate
- Engineering Controls
  - Decrease Amount of Contagion
    - Kill
    - Sequester
    - Block
    - Dilute

*Antibiotic and Antiviral prophylaxis recommended for outbreak control; not included as a preventive control measure due to possible increase in drug resistance and side effects.

Personal Measures

- Masks

Did Masks stop the spread of SARS?

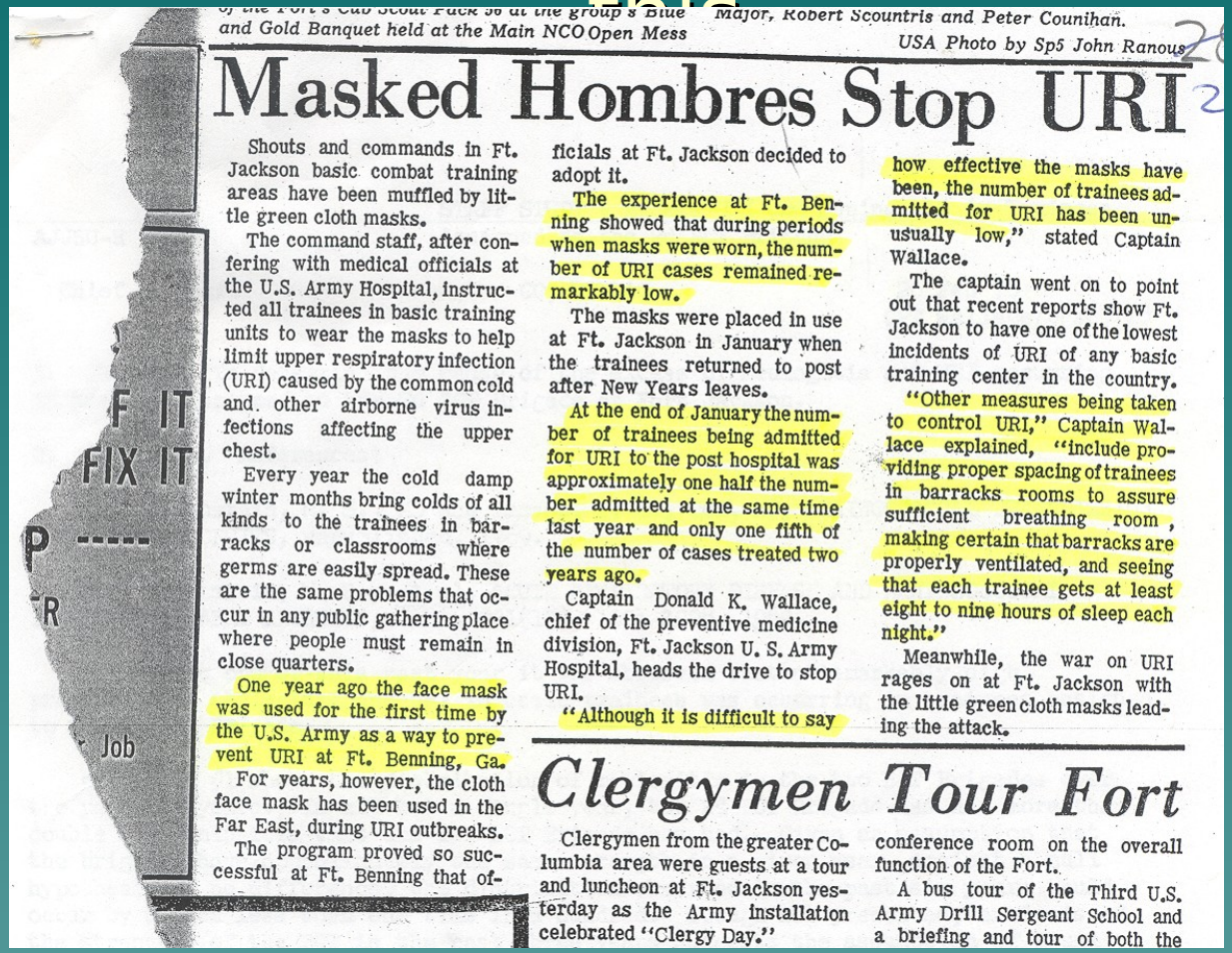
Did Masks stop the spread of Influenza in 1918?


快速
彩色胶卷

Were/Are Masks Used by the Army?

- 1942: Gauze-covered mask with a Canton flannel filter for Influenza prevention
- 1970’s – Fort Jackson, Fort Benning
- 2000 – Fort Benning Outbreak

Fort Jackson, Fort Benning 1970 (Fort Jackson Leader) – no formal report on this



and Gold Banquet held at the Main NCO Open Mess *Major, Robert Scountris and Peter Counihan. USA Photo by Sp5 John Ranous*

Masked Hombres Stop URI

Shouts and commands in Ft. Jackson basic combat training areas have been muffled by little green cloth masks.

The command staff, after confering with medical officials at the U.S. Army Hospital, instructed all trainees in basic training units to wear the masks to help limit upper respiratory infection (URI) caused by the common cold and other airborne virus infections affecting the upper chest.

Every year the cold damp winter months bring colds of all kinds to the trainees in barracks or classrooms where germs are easily spread. These are the same problems that occur in any public gathering place where people must remain in close quarters.

One year ago the face mask was used for the first time by the U.S. Army as a way to prevent URI at Ft. Benning, Ga.

For years, however, the cloth face mask has been used in the Far East, during URI outbreaks.

The program proved so successful at Ft. Benning that officials at Ft. Jackson decided to adopt it.

The experience at Ft. Benning showed that during periods when masks were worn, the number of URI cases remained remarkably low.

The masks were placed in use at Ft. Jackson in January when the trainees returned to post after New Years leaves.

At the end of January the number of trainees being admitted for URI to the post hospital was approximately one half the number admitted at the same time last year and only one fifth of the number of cases treated two years ago.

Captain Donald K. Wallace, chief of the preventive medicine division, Ft. Jackson U. S. Army Hospital, heads the drive to stop URI.

"Although it is difficult to say how effective the masks have been, the number of trainees admitted for URI has been unusually low," stated Captain Wallace.

The captain went on to point out that recent reports show Ft. Jackson to have one of the lowest incidents of URI of any basic training center in the country.

"Other measures being taken to control URI," Captain Wallace explained, "include providing proper spacing of trainees in barracks rooms to assure sufficient breathing room, making certain that barracks are properly ventilated, and seeing that each trainee gets at least eight to nine hours of sleep each night."

Meanwhile, the war on URI rages on at Ft. Jackson with the little green cloth masks leading the attack.

Clergymen Tour Fort

Clergymen from the greater Columbia area were guests at a tour and luncheon at Ft. Jackson yesterday as the Army installation celebrated "Clergy Day."

conference room on the overall function of the Fort.

A bus tour of the Third U.S. Army Drill Sergeant School and a briefing and tour of both the

Fort Benning Outbreak April 2000

Personal Measures

- Masks
  - Recommended by CDC for TB & SARS Control :
    - Surgical Masks for patients with TB or suspect SARS patients
    - N-95 Particulate Masks for those in contact with patient
  - Evidence of “real world” effectiveness is lacking
  - Impractical for sustained use in many cases

Administrative Controls

- Cohorting (Type 1)
  - Separating/isolating those with ARD symptoms
    - Already done to some extent, those with ARD symptoms are sent to infirmary
    - Generally may not be effective: Individuals usually contagious before symptoms (not known for SARS)
- Cohorting (Type 2)
  - Preventing Units from mixing/interacting
    - Most contact now is within companies
    - Mixing with other companies in dining facilities
    - Further cohorting will require change in training format

Administrative Controls

- Minimum Space Requirements for Bunks
  - Currently, AR 40-5 requires 72 sq. ft of net floor space (bed, locker but excludes lounges, bathrooms, general circulation, halls and stairwells) per recruit.
  - The basis for AR 40-5 goes back to influenza attack rates in troops in barracks observed in World War I.
  - Space Requirements were not based on scientific data but on professional judgment

Crammed troopships played perfect host to a breath-borne disease. Many troopships became floating "death-houses." Despite this, President Woodrow Wilson decided on October 8, 1918, to keep troops moving to Europe.

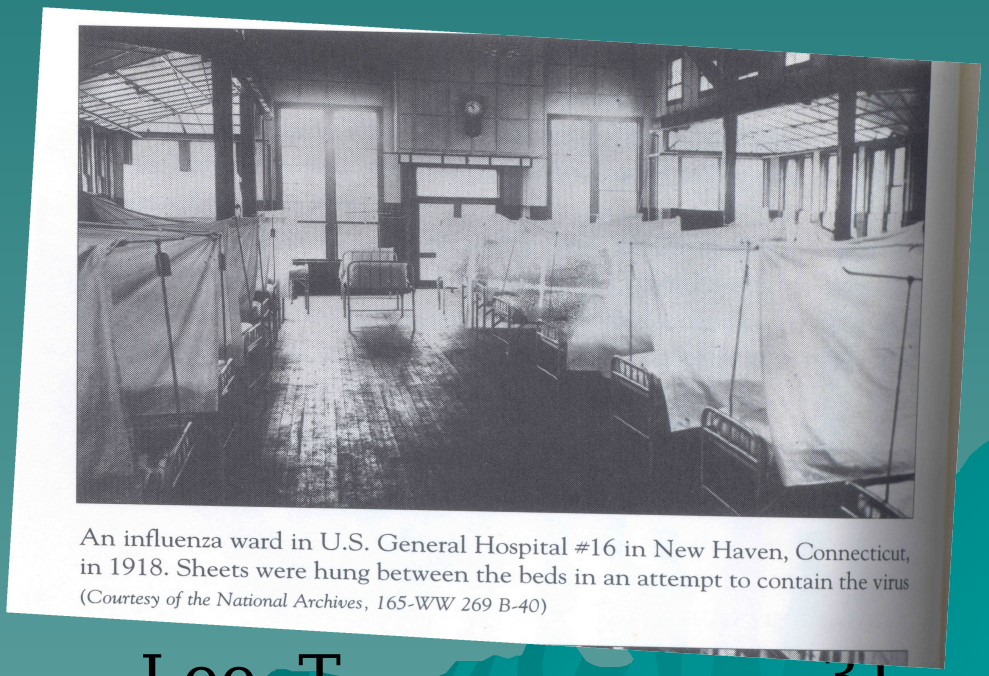
Administrative Controls

- Sleeping head-to-toe
  - This consists of sleeping troops in a line of bunks alternating head and foot positions
  - Currently practiced at training sites, no strong proof of efficacy
  - These methods are based on the assumption, which may be doubted, that transfer of respiratory infections occurs primarily in the barracks

Administrative Controls

- Cloth barriers between beds
  - No well controlled studies

Fort Benning Outbreak Apr 2000



An influenza ward in U.S. General Hospital #16 in New Haven, Connecticut, in 1918. Sheets were hung between the beds in an attempt to contain the virus (*Courtesy of the National Archives, 165-WW 269 B-40*)

Personal Measures

- Handwashing
  - In 1861 Semmelweiss noted the spread of nosocomial infections by hand.
  - Proven effective for nosocomial and enteric infections but less proof for ARDs.
  - Navy Recruit Study: Operation “Stop Cough”
    - Mandatory 5x daily handwashing
    - Education on handwashing for recruits and trainers
    - Mandatory liquid soap in barracks
    - “Wet sink” policy in barracks
    - Hygiene as part of inspections
    - 45% Decrease in ARD rates in trainees compared to previous years
  - Recommended by CDC for contact with suspected SARS patients and for protection for general public

Personal Measures

- Hand Sanitizers
  - Alcohol-based Hand rubs recommended by CDC in healthcare settings if hands are not visibly soiled
  - Hand rubs may be more effective against some microorganisms than traditional handwashing
  - Recommended by CDC for contact with suspected SARS patients and for protection for general public

Personal Measures

- Antimicrobial Handwipes
  - Not recommended by CDC in healthcare settings
  - Air Force Recruit studies
    - 33% reduction in sick call visits for URI among USAF squadrons using wipes with (parachlorometaxylenol (PCMX)). Visits for sore throat were reduced by 40%.
    - Recent unpublished study: PCMX wipes more effective than alcohol based rubs or handwashing
  - No recommendations on Handwipes by CDC for SARS

AN APPARATUS FOR DETERMINATION OF THE BACTERIAL CONTENT OF AIR[1]

A NUMBER of devices have been employed for determining the bacterial content of air. To be satisfa-

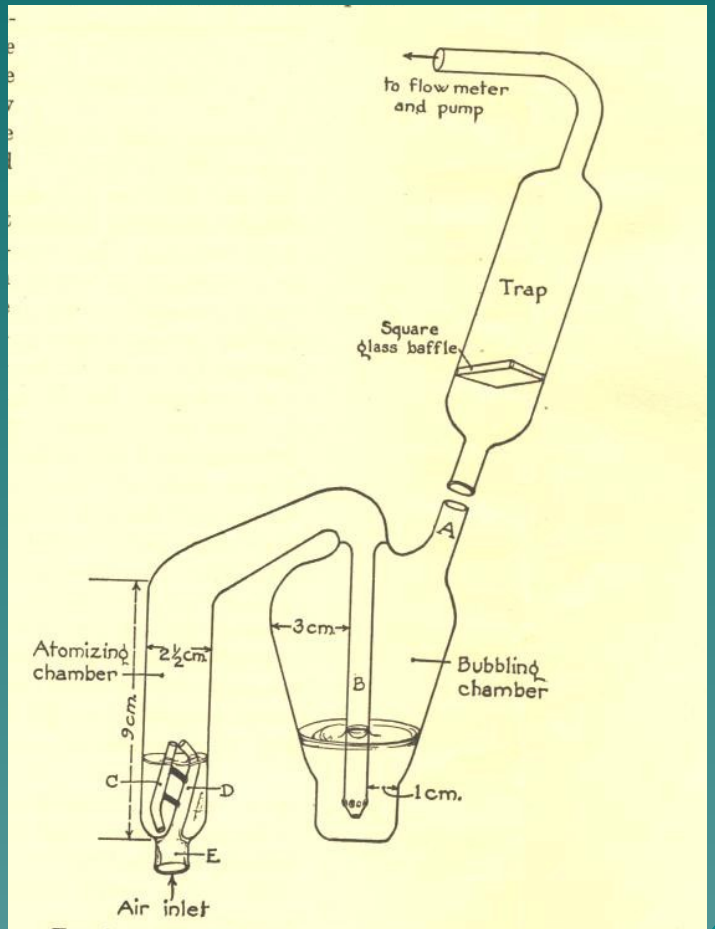


FIG. 1. Atomizer Collector for bacterial air analysis. The capillary, C, is about 1 mm, inner diameter; D is about 1.5 mm, inner diameter, at the tip. At the bottom of tube B are five holes 1 mm in diameter.

(1943)

Engineering Controls

- Ultraviolet (UV) Sterilization of Air and Glycol Vapor Sterilization of Air
  - In the 1940's researcher found slight efficacy of both ultraviolet or glycol vapor sterilization of the air for ARDs, but was determined to be impractical.
  - Only the facilities with the highest-risk-for-severe respiratory diseases consider UV air sterilization as practical (eg. TB isolation wards).
  - Contemporary Navy Study: No appreciable benefit; lights are very expensive
  - Recent Office Building Study: Possible benefit

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pages 271–280

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STERILIZATION OF AIR BY MEANS OF GERMICIDAL AEROSOL MISTS AND VAPORS

By OSWALD H. ROBERTSON, EDWARD BIGG, and THEODORE T. PUCK

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THE UNIVERSITY OF CHICAGO, CHICAGO, ILL.,

and ZELMA BAKER

MORIAL DENTAL CLINIC, THE UNIVERSITY OF CHICAGO, CHICAGO, ILL.

lization by means certain germicidal agents which killed bac-
apors is one which teria in the test tube in dilutions not high-

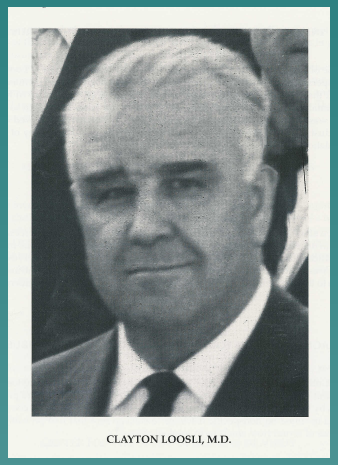
The Histories of

DR. OSWALD H. ROBERTSON, M.D.

6

Engineering Controls

- Dust Control (Oiling of Blankets & Floors)
  - The concept is that the routine cleaning of floors in troop housing (barracks) reduces the amount of airborne dust and associated resuspension of inhalable viral particles for training personnel.
  - Done in the 40's and 50's - not efficacious



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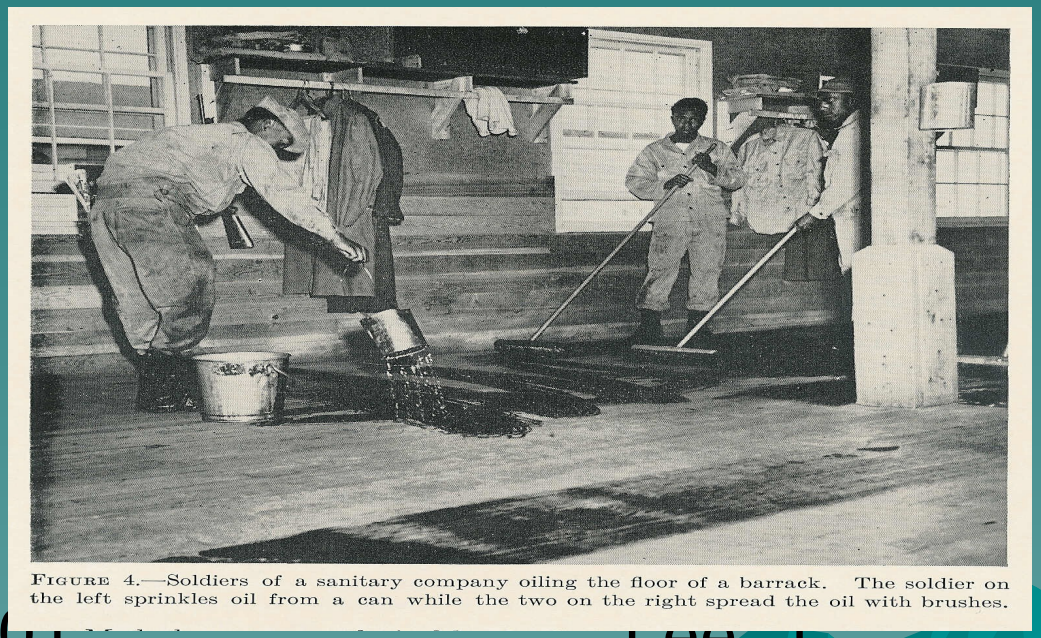
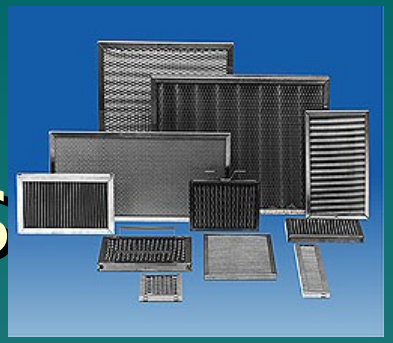


FIGURE 4.—Soldiers of a sanitary company oiling the floor of a barrack. The soldier on the left sprinkles oil from a can while the two on the right spread the oil with brushes.

The Histories of

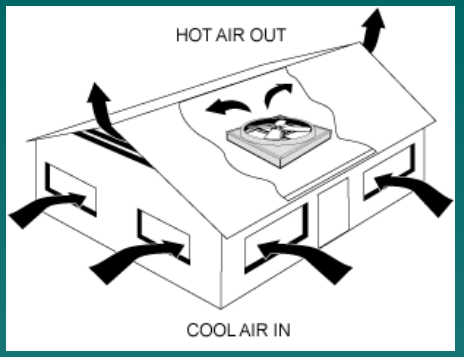
DR. OSWALD H. ROBERTSON, M.D.

Engineering Controls



- Ventilation Filtration Efficiency
  - High Efficiency Particulate (HEPA) Filters recommended by CDC to augment other engineering controls for TB patients
  - Non-HEPA Ventilation Filters – No controlled studies

Engineering Control



- Air Dilution Ventilation
  - The theory is that barracks that are adequately ventilated with fresh (clean) air will lead to dilution of airborne contaminants (i.e. unpleasant odors) as well as a decrease in the concentration of airborne microorganisms and dust.
  - 1998 JAMA: Brundage et. al.
    - Modern sealed energy efficient “Starship” barracks had higher ARD rates than drafty WWII barracks
  - Current ventilation standards based on comfort
  - No controlled studies on effect of ARDs

Recommendations and Conclusions

The following are low cost interventions that would be feasible in a military setting and thus warrant further consideration and study

- Hand Hygiene
- Cohorting
- Living Space Allocation
- Sleeping “Head to Toe”

- Additionally the following interventions are possibly efficacious and warrant study
  - Respiratory masks
  - Air dilution ventilation
  - Ventilation filter efficiency
  - Air Sterilization (UV)

Questions?